

**The uncounted casualties of war: epigenetics and the intergenerational transference of PTSD symptoms among children and grandchildren of Vietnam veterans in Australia.**

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PTSD – Post Traumatic Stress Disorder.

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**Abstract.**

*Knowledge is building about the heritability of Post Traumatic Stress Disorder (PTSD) in the children and grandchildren of Vietnam veterans. These children and grandchildren remain uncounted due to lack of recognition by the medical and social models. This lack of recognition enables them to fall through the gaps in our management systems. Several theorists have made assertions that attempt to explain the heritability of PTSD from genetic, social and environmental perspectives, but simply perpetuate it. Current trends in research are starting to investigate a complex integration of these perspectives that attempt to explain the heritability of a debilitating condition that has plagued humanity for generations past, and, perhaps, generations to come. This issue is discussed in relation to the relatively new perspective of Epigenetics. This paper reviews what we have come to understand as PTSD and debates the dominant paradigms that perpetuate its heritability and enable the existence of gaps in management systems.*

**Introduction.**

How can it be, that two subsequent generations can be connected to the same environmental experience, even though the second and subsequent generations did not experience the original event? Can it be plausible that a

change in environmental conditions that threaten an individual's life can produce altered psychological and physical characteristics in that individual's offspring, to enhance the survival of the species? Recent epigenetic research seems to support this assertion. Epigenetics involves the study of environmental events that can influence alterations in genetics. The belief that genes were set: and the information in them was locked and unalterable is now strongly challenged. It now appears evident that a significantly stressful event may have genetic consequences. This raises many questions about the source and nature of Post Traumatic Stress Disorder (PTSD) and many other mental conditions.

The recognition of PTSD as a disability is relatively new to Australia. There has been much debate over the acceptance of levels of disability and impairment. This debate continues today. However, unlike its American counterpart, Australian medical practice is reluctant to embrace the evidence asserting its heritability. Those who inherit the symptoms of PTSD often go undetected, or misdiagnosed, and unrecognised (Scott, 2004; Strand et al, 2005). Therefore the current casualties of a war that ended over 35 years ago are those who were yet to be born: the children and grandchildren who live its legacy today.

There is much speculation concerning the mechanisms for the heritability of PTSD and a significant amount of resources are invested in supporting the perspectives of each dominant paradigm. However, in doing so, they are drifting further away from the core of the source: the very reason for investigating this phenomenon in the first place - the very experience of PTSD itself. As a consequence of this misdirected research epic over the past 40

years, a whole generation has been studied to the point where there is very little we do *not* know about PTSD in that generation from a medical model perspective and its social impacts. What has been neglected, however, is the myriad of issues this condition creates for subsequent generations who are born and raised in a PTSD-influenced environment. This raises several pertinent questions on what the ramifications of intergenerational PTSD are, how they develop, and how best to manage them.

This paper investigates one of these questions from the perspective of the children and grandchildren of Vietnam veterans in Australia who have at least one parent with clinically diagnosed PTSD that manifested as a consequence of their Vietnam war experience.

## **What is PTSD?**

PTSD is recognised in Australia as a disability (Department of Veterans Affairs, 2007) and for very good reasons. The most widely referenced diagnostic tool for the diagnosis of mental conditions by mental health professionals is the DSM-IV-TR (Rosenman, 2002). This biblical reference defines PTSD as having severe, life-long, multi-factorial and personality altering effects. Arising from this initial intense fear is a sequele of symptoms that include intrusive memories, disorganized or agitated behaviour, nightmares, hypervigilance, flashbacks, emotional numbing, illusions, intense distress, significant avoidance, lapses in memory, detachment from social and family participation, irritability, sleep disturbances and more. These can all arise out of a single, isolated event.

### *Childhood symptoms.*

Children may report similar symptoms as well as additional ones that are specific only to childhood trauma. These specific symptoms include acute avoidance behaviours, separation anxiety, fixation and fascination with an object or words that may or may not be related to the trauma. They may even lose a fundamental skill such as toilet training or self-dressing. These can be expressed through play, art or verbal expression (National Centre for Post Traumatic Stress Disorder, 2003; O'Brien, 2004). Of note is that these symptoms described in the DSM-IV-TR relate to the progenitor (the first person in the family history to acquire the condition) not to subsequent generations, although it does mention heritability of PTSD for the next generation.

Interestingly, we are starting to recognise these symptoms in children of PTSD sufferers even though these children have not experienced a traumatising event themselves (Johnson, 2006). Indeed, the DSM-IV-TR states that the incidents of PTSD are common in the first generation offspring of PTSD sufferers (APA, 2000), but stops there. There is no suggestion that there may be a multi-generational heritability of these symptoms. However, this does indicate that the psychological and physical ramifications of the Vietnam War are manifesting themselves in the children and grandchildren of the Veterans that developed PTSD (Australian Medical Association (AMA), 2005). Research suggests that many of the psychological consequences may be misdiagnosed in our children (Scott, 2004; Strand et al, 2005), and therefore mistreated, producing not only a drain on our already limited resources, but possibly exacerbating the negative social, community and

individual effects attributable to the legacy of PTSD. What is needed is a deeper understanding of how these symptoms become heritable between generations. Each of the perspectives from both the nature and nurture approaches does little more than further confuse the issue and raise further questions. The clues to the solutions can be found at the intersection of these dominant perspectives. That intersection is Epigenetics.



## **Epigenetics.**

Epigenetics is not a new perspective. It has been around in the fields of anthropology and human psychology in various guises for several years. It is only recently, that it has taken on this latest guise and presented itself as a very plausible and rational explanation for the emergence of the intergenerational effect of the symptoms of PTSD.

An emerging field of researchers and practitioners agree that an individual may be born with a genetic predisposition to having a higher-than-‘normal’ risk of developing PTSD and/or any of the associated conditions after even a mildly traumatic event. Current trends indicate researchers and mental health practitioners are willing to embrace the perspective that PTSD can be inherited. Those that do, argue vehemently the severe stressful event which occurred in the individual’s immediate environment produced an alteration in genetic information which is passed on to subsequent generations. They argue that genes exist in each of us that are responsible for the modulation and appearance of specific and ranging conditions, both physical and mental, and that a significant environmental event can produce a neurotransmitter that locates these genes and switches them on or off, creating a type of “genetic memory” (Ridley, 2003).

Epigenetics combines both sides of the nature/nurture debate in a bold assertion that events in our environment influence the expression of genes, and it is these genes that dictate our behaviours. In this way, epigenetics can satisfy the assertions of both camps. There is a lean, however (and an obvious one) that urges changes in genetic information are direct consequences of changes in environments. To explain this further Ridley

(2003) describes significant events in human evolution as being a genetic response to an environmental change. This postulation asserts that, in order to survive as both individual and species, humans must make rapid, and permanent changes, and these must be heritable to ensure species survival.

The proposal that the effects of traumatic stress can be genetically transferred is a controversial topic that has recently sparked a wave of research and argument. Most researchers agree that PTSD can be passed to the next generation. The mode of transfer is what they cannot yet agree upon. The classic debate of Nature vs Nurture perpetuates in the case of the intergenerational transference of PTSD. The following section will present some of the prominent research that advocates for an environmental origin for the heritability of PTSD.

### **Nurture.**

This founding perspective of psychology asserts that the behaviours associated with PTSD in subsequent generations are learned ones and assumes that the child models their responses to stressors on their parents and significant role models (Stern, 2000). This implies a range of additional factors which force their influence on this perspective. Nurture can be divided into three principle categories of socio-economic status (SES), parenting and experiential learning.

### *Socio-economic status (SES).*

A considerable amount of literature exists that asserts PTSD is transferred to subsequent generations though the living standards the child grows up in. Barry, Dunlap, Cotten, Lochman, & Wells (2005), World Health Organisation (2001) and Lupien, Fiocco, Wan, Maheu, Lord, Schramek, & Thanh Tu (2005) support this assertion. Jayakody & Stauffer (2000) investigated the heritability impact of SES with single, unemployed mothers with trauma-related conditions and reported a high correlation between SES and the existence and development of disorders in their children. This was also found in longitudinal studies with youth (Juntunen & Wettersten, 2006; Lupien et al., 2005; Peach, 2005; Porter, Lawson, & Bigler, 2005). Even after controlling their data for parenting styles, these studies still found the same conclusion.

The refugee cohort has been extensively studied with relation to this aspect. The vast majority of refugees come from low-socio-economic groups. Ingleby (2005) and Pupavac (2002) point out that most refugees to Australia come from countries that have a long history of war, conflict and oppression. Therefore these refugees bring this history with them in their cultures and families. The heritability of trauma has been deeply entrenched in their responses to stress and adversity, and, after several generations of adaptation to this hostile environment, the likelihood that permanent genetic changes have occurred are very high indeed.

### *Parenting.*

Chase-Lansdale, Wakschlag et al (1995) claim that parenting styles account for a significant proportion of intergenerational transfer of a majority of disorders and anti-social conditions as the child can receive their emotional

programming from their parents. These parenting styles can significantly influence the manner, method and ability of children to manage emotionally distressing situations. The impact of parenting styles can never be underestimated in the transmission of PTSD symptoms as it impacts significantly on the development of their child's personality. A parent with PTSD may use inappropriate parenting strategies (such as violence, hypervigilance or silence). According to research, this is likely to be transferred to their child (Parent, et al, 2005; Tan-Roland, 2005) and the cycle of inappropriate parenting continues, in a sense, becoming hereditary.

Some families harbour a trauma that may date back several generations and have no relation to the current political, cultural or social environment. The hostility and frustration they associate may trigger dysfunctional and antisocial behaviour in an individual and population (Weingarten, 2004). Such examples exist in persecuted races such as the Jewish and Australian Aboriginals. Parents who have directly experienced this trauma will instinctively protect their children from further harm. They may encourage acts and attitudes of hostility towards a potential aggressor, even if the threat is not present. If it is perceived to have the possibility of being present, this may be enough to invoke an inappropriate reaction.

Partners of parents with PTSD may also transfer behavioural dysfunctions to their children (Ewing, 2005). As the partner attempts to make sense of the dramatic changes in the personality of their loved one, they may infer and assume much based on miscommunication or lack of communication from that loved one. This breakdown in communication is at high risk of being passed on to siblings. This assertion is supported by the DSM-IV-TR (APA,

2000). A lack of understanding and communication forces a child to make their own inferences regarding their parent's behaviours.

### *Experiential learning.*

The bulk of available literature found seems to focus attention on this form of acquisition and transfer of PTSD symptoms. A concentration on the immediate consequences of traumatic experiences is evident in the research and therefore treatment of this condition. This perspective asserts that PTSD symptoms only occur as a result of an individual's reaction to their traumatic experience. This includes their upbringing, and therefore the parenting styles of their father and/or mother. It suggests that the individual forms their identity and meaning of PTSD (and thus the behaviours expected of them) by their interactions with their society and environment. They may seek others with similar experiences to validate their own and give a deeper meaning to them by reassuring their situation and reactions that, to those without such symptoms, are problematic. What this perspective neglects is the influence of any predispositions to either exposure or limitations in stress threshold capabilities that individual possesses and projects. These predispositions and limitations may have genetic origins that are *stimulated* by environmental events, making them epigenetic.

The dominant cases for the argument from the nurture perspective are convincing. However, they fail to consider what pre-existing information (survival instinct) may have been present that predisposes an individual or population to experiencing and reporting certain qualities. This point is addressed by the genetic perspective.

### **The genetic evidence/ nature perspective.**

The supportive literature for a genetic link in the heritability of PTSD is extensive, and growing. The scientific community appears to be favouring this approach over the more traditional environmental perspective. This shifting trend in research may be due to increasing pressure to understand the issue from both sides to acquire a complete picture, or it may be for other reasons. The following section presents a summary of just some of the prominent research in the genetics behind PTSD that demonstrates its prevalence.

### *Intergenerational conditions.*

There is a substantial amount of research that claims PTSD in one generation may produce myriad of mood and behavioural disorders in the next (Yehuda, 2002; O'Brien, 2004). The types of disorders include, Depressive and Anxiety Disorders (Spencer, et al, 2000, Tannock, 2000), ADHD (Adler et al., 2004: Brown, 2000; Hudziak, 2000), Antisocial Personality Disorder (Goodwin & Hamilton, 2003), Conduct Disorder (Koenen et al., 2005), Aspergers (Burger & Lang, 1998), and range in severity from very mild to chronic. These and others are linked to socially unacceptable behaviours such as violence and aggression, substance-related behaviours, and suicide that become a significant burden to both the individual and our society (Davidson et al., 2004).

Although the bulk of studies on PTSD and its effects are conducted mostly on adult subjects with a history of military service (Yehuda, et al., 2001), there are further findings of studies conducted on other causes of PTSD such as road trauma (Matthews, 2005), terrorism (Fetter, 2005; Brown & Bobrow, 2004), sexual trauma (Friedman et al, 2005; McNally, 2005), natural disasters (Procter, 2005), holocaust trauma (Yehuda, et al, 2005), and medical trauma (Palmateer, 1982), that further suggest the heritability of PTSD symptoms.

Still more evidence comes from Yehuda, Halligan and Bierer (2001) who demonstrated a significant specific association between parental PTSD and the occurrence of traumatic stress-related conditions in offspring. There is a substantial pool of research to support this. For example, Schiffmann (2003) and Segman et al (2002) report that a genetic alteration of the Dopamine Transporter (DAT) has been positively linked to PTSD. Dopamine has also been found to have significant implications on Attention Deficit Hyperactivity Disorder (ADHD) and Conduct Disorders (Rowe et al., 2001), alcoholism (Johnson, 1996; Laine, 2001) and depression (Nierenberg, Dougherty & Rosenbaum, 1998). This supports studies that find these conditions to be genetically linked to PTSD (Tarrier & Gregg, 2004; Donnelly, 2003; Xian et al., 2000).

#### *Further intergenerational evidence.*

Further evidence for genetic basis to the heritability of PTSD symptoms stems from Stein, et al., (2002) who concluded that PTSD symptoms are moderately heritable in combat veterans after both combat related and non-combat trauma. Several studies have been conducted that investigate the

genetic relationships between PTSD and other disorders such as generalized anxiety disorder and panic disorder (Chantarujikapong et al., 2001; Scherrer et al., 2000), borderline personality disorder (Golier et al., 2003) and alcohol and drug dependence (Chantarujikapong et al., 2000; Xian et al., 2000). Each study found a strong statistical relationship behind the genetics for each disorder and concluded that, not only was each of the disorders manifested by traumatic stress in the individual, but was causal in their offspring (O'Brien, 2004).

As demonstrated by this summary, there is a substantial amount of literature and research available on this prevalent issue. The amount of evidence to support a genetic basis for the existence and intergenerational transmission of PTSD is strong and growing stronger. This is exacerbated by the amount of research evolving out of the environmental argument which is also growing stronger. It is evident by this level and amount of research, that the heritability of PTSD is a serious concern for not just the individual affected by it, but the society in which they live. Each of these perspectives seems to be deeply focussed on proving their perspective to be more accurate or appropriate than the other. However, an important, fundamental gap is missing in the equation of knowledge and understanding that is created by a connection between the two schools of thought that endorses the perspective that our genetics may be influenced or even manipulated by events in our environment. This conceptual bridge that reconnects the two dominant ideologies is epigenetics.



## **Genes AND environment.**

Merely identifying a gene responsible for the inheritance of PTSD or its associated conditions will not provide all solutions. The ultimate “Ah, ha” will not be reached. It must incorporate influences from the environment upon those genes and whether those influences activate those genes or not. The research from both the nature and the nurture camps is strongly advocating for a merger of both perspectives. This is not a new proposal. (Kendler & Greenspan, 2006) suggest that both genetics and environment are critical in behaviour and attribute formation. The debate now seems to be around whether it is genetics that influences the individual's manipulation of and reaction to their environment, or the environment that asserts adaptation in the individual's genes. It's the chicken and the egg revisited. The nature/nurture argument of behavioural science continues. Yet epigenetics may provide a rational explanation.

### *Human genome project: “The blueprint of life”.*

Although epigenetics is not a new perspective, it has only recently gained momentum in the fields of anthropology, genetics, and controversially, psychology. This has been due to the momentous endeavour to identify the blueprint of humanity, termed the Human Genome Project.

In 2000, the Human Genome project began in earnest to attempt to plot a blueprint of the genetic ingredients of being human. It was expected that the outcomes of the project would clearly identify which genes caused what in everyone. It was planned to be the ultimate recipe book for creating the perfect human, but it provided far less than was expected. What was originally

thought to be a code of around 100,000 genes that were responsible for the expression of every physical and psychological attribute known to humans was drastically reduced to 30,000 (Hamer & Copeland, 1998; Ridley, 2003). More recent sources put this number at around 20,000 – 25000 (US Department of Energy, 2008). This shocked the scientific community and caused much mayhem. However, fewer genes meant that not everything could be put down purely to genetics and that the diversity of humanity was also critically dependent on our environments. Statistically speaking, 30,000 genes is an enormous number of possibilities. To put it another way, turning a gene on or off can be likened to flipping a coin: there are two possible outcomes. There are more than ten billion possible outcomes to flipping a coin just 33 times (and this would be enough genes to make every human unique), making 30,000 appear to be not such a small number at all. Two multiplied by itself 30,000 times results in a number greater than the theoretical total number of particles in the known universe. Thus, if less genes corresponds to more free will and diversity of experience, then fruit flies are freer than humans, bacteria even freer and mono-genetic viruses the Nirvana of all life everywhere (Ridley, 2003).

Despite the overwhelming evidence that genetics are significant stakeholders in the heritability of mental illnesses, this questions how new instances that have never existed in the families history previously, suddenly arise in one generation and perpetuate for several more. As originally proposed in this paper, it may be that the human individual and species survival mechanism activates in response to environmental changes. This, again, opens a doorway for Epigenetics.

### **Epigenetics: support for an evolutionary mechanism.**

The human organism is an incredible adaptor. In order to survive, it will rapidly adapt to a changing and challenging environment (Kendler, Gardner, & Prescott, 2003). When threatened, the human survival reaction kicks in and the body makes whatever adaptations are necessary to prolong life. These adaptations are transferred to offspring to increase their chances of a prolonged life and survival of the species. This is the basic premise of evolution. If a hostile environment can activate latent survival traits, then that individual has a better chance at adapting to this hostile environment and surviving, whereas an individual that does not possess those latent traits is less likely to survive. Therefore the offspring of that individual with the latent survival traits is also more likely to survive if they, too, possess those traits, Thus creating a step in the process of evolution. If humanity is exposing itself to more and more psychological trauma, then, perhaps, an evolutionary adaptation is not such a bad thing.

However, if the offspring are born into an environment where the original threat no longer exists, then those survival adaptations may present as a problem. In a simplified explanation, this may be the current issue with intergenerational effects of PTSD upon children and grandchildren of Vietnam veterans.

This Darwinian approach may seem very basic and animalistic, but, then again, that's just what we are. Ridley (2003) asserts the argument should not be of nature versus nurture, but of nature via nurture and that genes are designed to take their cues from the environment. For the children and

grandchildren of Vietnam veterans, this is a particularly important concept to assimilate into an already challenging understanding of their “selves”.

## **Conclusion.**

The prevalence of PTSD is on the increase. There are more and more instances of psychological instability arising out of significantly distressful events. PTSD is just one of the consequences of such an event. As its prevalence is on the rise, it is crucial to rapidly develop an understanding of the mechanisms of its transmission, existence and manifested forms in the children and grandchildren of those who experienced the original traumatic event. Failure to do so appropriately will only result in personal, community and social strain.

It has been suggested that many conditions manifesting in childhood may actually be PTSD, but, to lessen the complication of diagnosis, and to shrug the genetic argument, since the child did not directly experience a traumatic event, the sceptics claim they must have something else. Children with familial histories of PTSD would therefore indicate either high-risk for potential emotional and conduct disorders, or high levels of resilience. Moreover, these differences demonstrate the necessity for further research to be conducted into the ramifications of this condition on the lives of children and grandchildren in relation to their emotional, social and psychological well-being.

There is no one answer to how trauma is transferred intergenerationally. A complex combination of genetics and environment that controls the quality and quantity of transference is the most probable. The geneticists argue that

genetic inheritance can predispose an individual to developing a personality that is prone to a reduced management threshold for stress.

Environmentalists argue that parents can create a debilitating or supportive environment that enhances the learned response of children to model their behaviour off these significant role models. Epigeneticists argue that events in the environment can turn genes on or off that produce the responses, and transmit them in genetic code to subsequent generations. Regardless of how trauma is acquired, the various social management systems that perpetuate and control appropriate and inappropriate behaviours need to be aware of this issue and begin a systematic collection of the experiences of children with disabilities to accurately inform the evolution of policy.

It is also evident from the research presented that PTSD, as a human condition, has evolved with each generation it affects. The diagnostic criteria that identified and described PTSD in the post-Vietnam era cannot therefore be applied to the current era, as both the individual and the society and culture in which they live have evolved. Thus the diagnostic criteria must evolve with it. Otherwise the condition will be misdiagnosed, misunderstood, misrepresented and mismanaged. Indeed, this may just be the case with the rapid rise in the numbers of Australian children being diagnosed with ADHD and Conduct Disorders. The DSM-IV-TR acknowledges the genetic link between PTSD and ADHD in first generation offspring. Could it be, (as proposed by Scott, (2004) and Strand et al, (2005)) that ADHD is simply PTSD in an evolved form since the diagnostic criteria have not similarly evolved?

PTSD is just one of a myriad of psychological and physical conditions that are transmitted from one generation to the next and carries the nature/nurture debate. PTSD was chosen due to its increasing prevalence in Australian society that stems from several causes of psychological trauma (such as rape, accident, holocaust, armed hold-up and bullying, and international conflicts and peacekeeping missions). With this issue being of such social and economic prominence, it is vital that mental health practitioners and the government rapidly decide which management perspective it will adopt.

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